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Obviously, too, the pond will undergo much change within the first few years of its existence. The trees and brush the roots of which are submerged will die, fall, be cast up—some of them—on the bank, and rot. I think the drift adjacent to the banks will be most abundant the first year or two. As soon as the small brush in the water next to the bank is gone, the drift will go ashore at high-water mark, lodge as the water falls, and cease to be a shelter for larvæ. The grass and weeds proper to the land will disappear and aquatic growth take its place. The banks, where exposed to wave action, will become steeper and cleaner. Small fish should, I think, greatly increase if the water is suitable, as the shallow water on the gently sloping banks of the upper parts of the pond and of the creeks should furnish them ideal breeding places. Predaceous insects should also increase in a permanent body of water. On the whole, the pond will, I think, become less suitable for breeding mosquitoes as it gets older, all factors working to this end except the growth of aquatic grasses and algæ. Upon the extent of this—the growth of aquatic vegetation and the protection it gives the larvæ from fish—will largely depend the rôle of the pond in permanently breeding mosquitoes.

AN EPIDEMIOLOGICAL STUDY OF A PLAGUE FOCUS.

By CHARLES V. AKIN, Assistant Surgeon, United States Public Health Service.

On September 25, 1914, two plague-infected female rats (*Mus norvegicus*) were taken in snap traps in New Orleans at 1013 Magazine Street, the building in which they were found being a combined stable and junk warehouse. Both rats were determined positive on the day of finding. The fact that the building is situated just across the street from 1006 Magazine Street, a previous focus in which plague-infected rodents were found on August 27, 1914, is evidence of the continuation of infection in the neighborhood, though it had been stamped out at 1006 Magazine Street. Both localities are in the heart of a belt which was heavily infected. It is believed that the infection at 1013 Magazine Street followed that at 1006 Magazine Street on account of a large number of infected rats which survived.

Notation of the architectural peculiarities of this building will perhaps be of value in determining relationship between "cause and effect" as evidenced in mice plague later found there.

The premises at 1013 Magazine Street occupy a very large lot, which is inclosed on all sides by a brick wall running to the full height of two stories. Within the inclosure were found many interesting features. This building is in the form of a great double L (L-T), the bar and wings being 22 feet wide, encircling on three sides an interior court, the playground of pigeons, chickens, and

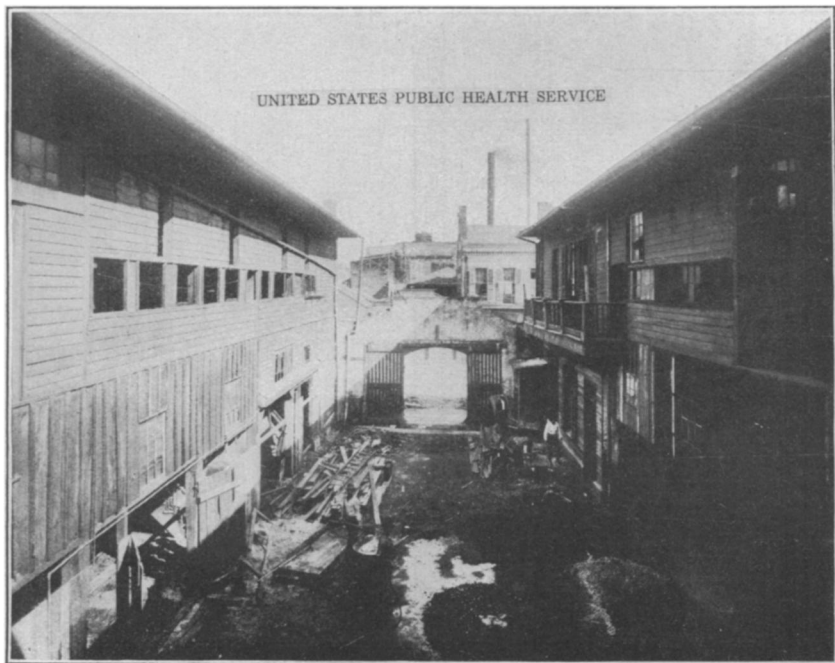


FIG. 1.—GENERAL VIEW OF PREMISES FROM SECOND FLOOR. BLOCK IN WHICH PLAGUE RATS WERE PREVIOUSLY FOUND.

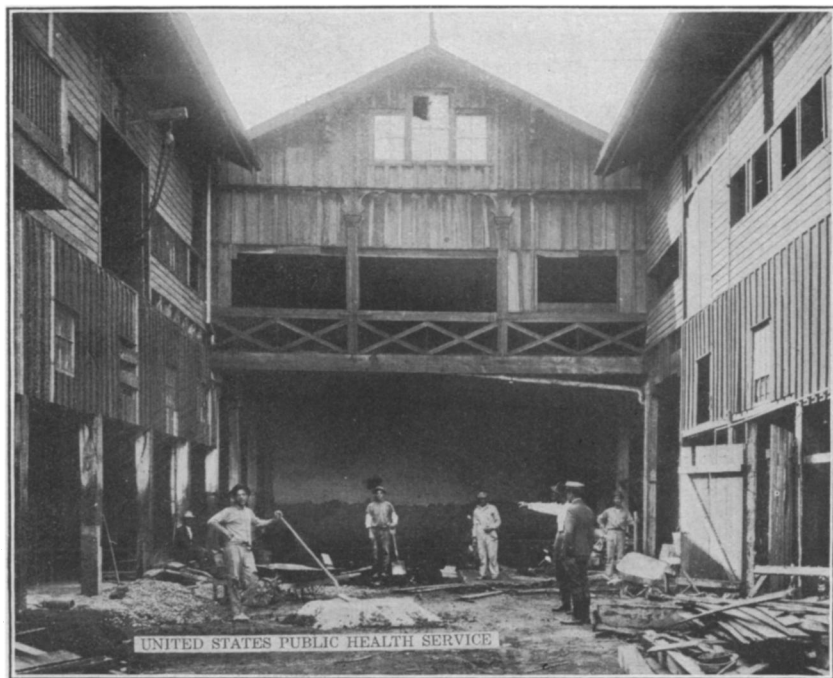


FIG. 2.—VIEW OF REAR AT 1013 MAGAZINE STREET, SHOWING PORTION OF STABLE AND JUNK WAREHOUSE WITH FEED ROOM IN CENTER ON SECOND FLOOR.

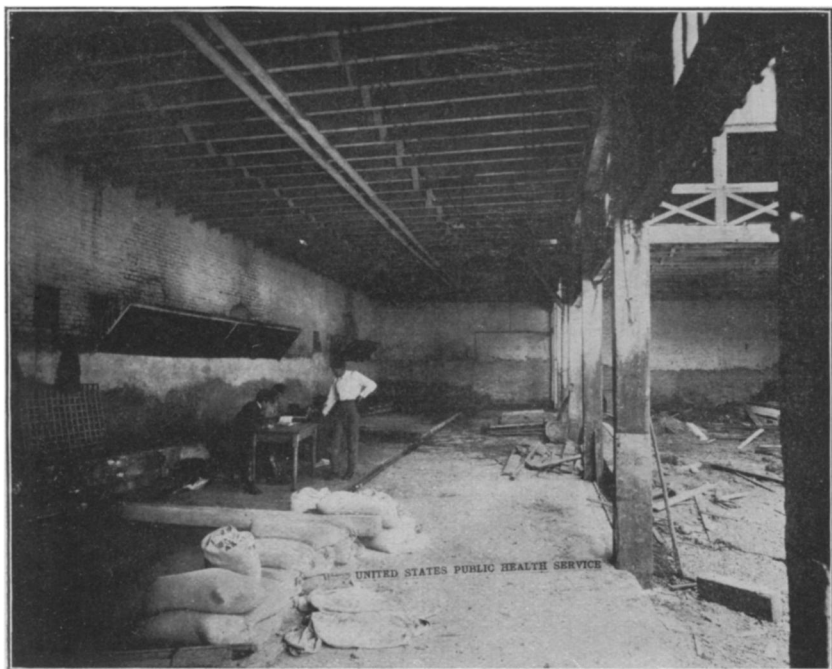


FIG. 3.—GROUND AREA OF STABLE, SHOWING CONCRETE FLOOR AND CEMENTING OF BRICK WALLS.



FIG. 4. —JUNK WAREHOUSE IN RIGHT WING; LATER TORN OUT.



FIG. 5.—SHOWING DEMOLITION ON SECOND FLOOR OVER RESIDENTIAL PORTION.

three unusually good rat dogs. These dogs, while not effective under the ordinary conditions of everyday life, were responsible for a very gratifying catch when the wrecking gang began operations the next day.

To the left on entering was the house occupied by the stableman, a two-story plaster-wall structure, continuous with the stable on the ground floor and the feed and plunder room above. When the floor of this house, which was not more than 6 inches from the ground, was removed, 54 of the total of 86 rats were killed; of these, 20 were plague infected. The stable occupied the remainder of the left wing and bar, connecting with the right wing. The right wing, both up stairs and down, was filled with a collection of miscellaneous junk and débris. The front of this wing was a duplicate of the stableman's house and on demolition yielded 18 rats, of which 7 were plague infected. The floor on this side was of rotten planking laid flat on the ground, which afforded concealment for many rat and mouse nests.

The premises were vacated and closed pending the completion of rat proofing. Immediately following this the residential portion was thoroughly fumigated with sulphur and the entire building from roof to ground was disinfected by spraying with a 2 per cent solution of kerosene emulsion. About 6,000 poison baits were placed, every possible nook and cranny being gone into.

The work of demolition of floor and interior structure was begun on September 26, 1914, attention being first given to the stableman's residence. The plank flooring of the entire ground area was removed, great care being taken not to scatter rats. The men were ably assisted by three dogs belonging to the stableman, and only a few rats escaped through a hole in the brick wall. These walls were about 60 years old, being constructed of soft brick laid in most inferior mortar of river mud and oyster-shell lime. At one point the rats, being assisted by the natural cracking of these walls and their extremely poor construction, had excavated to a point about 8 feet above the floor. Six rats were taken from this cavity. Double plaster walls were removed up and down stairs, exposing countless rat cuts, nests, and bones of every description. It is interesting to note just here that in spite of the burning of 80 pounds of sulphur to not more than 4,200 cubic feet of room space (giving 16 per cent sulphur dioxide gas), no rats had been compelled to leave their hiding place beneath the wooden floor, owing to its imperviousness to the diffusion of gas. A nest of live young rats was found when the floor was removed.

The plank flooring of the stable and warehouse was removed, taken into the street, and as rapidly as possible carted away.

All rats taken at this time were female *Mus norvegicus*, with the exception of three male *Mus norvegicus* and one *Mus rattus*, which was

killed while trying to return to his home on the second floor. Mice were rarely seen, and not until several days later were any caught.

The work of concreting the ground area of both house and stable had been going along steadily. No more rats were trapped until October 12, 1914, when two infected rats were caught in snap traps. One was a female *rattus* taken on the second floor. Careful observation made it plain that thorough precaution had not been taken to destroy all harborage. On questioning the workmen it developed that each afternoon about 5 o'clock small black rats were seen running along joists just below the second floor and down a water pipe to a watering trough below.

A wooden ceiling had been left over a small single-walled room on the second floor, and there were found two dead *Mus rattus*. On subsequent days other *Mus rattus* were found dead on the upper floor behind piles of unused materials, which had been taken up from below. Much of this had been piled 2 feet from the floor, but at that time it was against the wall, and it was thought it might afford hiding places. Racks were built 2 feet high in middle of floor, and every article was placed on them. A second disinfection and poisoning followed. Mice were becoming more evident each day, and a nest was discovered in a cavity in the wall left by the removal of a brick. On discovery of this the plastering of the brick wall to a height of 5 feet from the floor, entirely around the building, was ordered. The discovery referred to demonstrates very clearly the necessity of careful search for even the most minute crevices in all places in which plague infection has been shown to exist and the complete closing of these crevices with cement mortar. This will eliminate the possibility of mouse harborage.

On October 16, 1914, a female mouse was caught in a snap trap and determined plague infected the same day. This most unusual and interesting occurrence can be accounted for by considering the sequence of species infection.

At first only *Mus norvegicus* were seen. Their natural strength and cunning gave them a clear field, and it was not until they were all killed that the more timid *Mus rattus* and *Mus musculus* approached. The death of the ground rats liberated a large number of fleas, a certain percentage of which were plague infected. Following their instinctive craving, they sought other rodent hosts, and the advance of the *Mus rattus* gave them just what they needed. It was only after the complete destruction of the Norwegian army that plague-infected *Mus rattus* were found. The mouse infection was the natural outcome of the mice being always cooped up in close proximity to these rats. Still, they were, to a certain degree, safe from the rat itself because of excellent protection afforded by breaks in the soft brick wall. These openings were small enough to bar the pursuing rat, but not small enough to exclude the hungry flea.

Points of interest in this study are:

First. Absence of human plague, though people were living over a hotbed of infection. This is explained by the great number of rats which afforded ready and convenient hosts for all fleas leaving dead rats. Human blood, at all times less attractive to them, was not necessary for food.

Second. The relation between concentration of rodent infection and type of architecture. This building was ideal for rodent infestation of all species. The harborage for the *Mus norvegicus* was beneath the wooden flooring of the residence and other planking was flat on the ground.

Safe homes for the *Mus rattus* were afforded by inclosed spaces on the second floor.

Soft brick walls, honeycombed with breaks and small cavities, afforded unusually good lodging places for mice (*Mus musculus*). A plentiful supply of small grain, scattered broadcast up stairs and down, fed them all lavishly.

That this infection was recent is proven conclusively by its slight radius of extension. Recognized early and almost completely destroyed by radical, effective measures, it was limited before sick rats could carry the infection to adjoining territory. The scarcity of rats found dead would further go to show the importance and success of early recognition and stamping out of a rodent plague focus.

As a final point of interest, too much attention can not be given to the thorough destruction of rat harboring and rat hiding places. No innocent-looking, dark "hole in the corner" should be overlooked, for hunted rats in their wild efforts to escape destruction will take advantage of it.

The careful search for and thorough plastering of all breaks and holes in brick walls on premises where plague has been found will preclude the possibility of a subsequent mouse infection.

PLAGUE-ERADICATIVE WORK.

CALIFORNIA.

The following report of plague-eradication work in California for the week ended December 5, 1914, has been received from Passed Asst. Surg. Hurley, of the United States Public Health Service, in temporary charge of the work:

SAN FRANCISCO, CAL.		SAN FRANCISCO, CAL.—Continued.	
RAT PROOFING.		RAT PROOFING—continued.	
Inspections of new buildings under construction.....	287	Yards, passageways, etc., new buildings (sq. ft. 42,979).....	52
Basements concreted, new buildings (sq. ft. 44,658).....	22	Total area of concrete laid, new premises (sq. ft. 272,887).	
Floors concreted, new buildings (sq. ft. 185,250).....	28	Inspections, class A, B, C, fireproof buildings.....	137